



Western Australian Certificate of Education Examination, 2010

Question/Answer Booklet

INTEGRATED SCIENCE

Stage 2

Please place your student identification label in this box

Student Number: In figures

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In words

Time allowed for this paper

Reading time before commencing work: ten minutes
Working time for paper: three hours

Materials required/recommended for this paper

To be provided by the supervisor

This Question/Answer Booklet
Multiple-choice Answer Sheet
Formulae and Data Sheet

To be provided by the candidate

Standard items: pens, pencils, eraser, correction fluid/tape, ruler, highlighters

Special items: non-programmable calculators satisfying the conditions set by the Curriculum Council for this course

Important note to candidates

No other items may be taken into the examination room. It is **your** responsibility to ensure that you do not have any unauthorised notes or other items of a non-personal nature in the examination room. If you have any unauthorised material with you, hand it to the supervisor **before** reading any further.

Structure of this paper

Section	Number of questions available	Number of questions to be answered	Suggested working time (minutes)	Marks available	Percentage of exam
Section One: Multiple-choice	20	20	30	20	20
Section Two: Short response	8	8	110	120	60
Section Three: Comprehension	1	1	40	20	20
Total					100

Instructions to candidates

- The rules for the conduct of Western Australian external examinations are detailed in the *Year 12 Information Handbook 2010*. Sitting this examination implies that you agree to abide by these rules.
- Answer the questions according to the following instructions.

Section One: Answer all questions on the separate Multiple-choice Answer Sheet provided. For each question shade the box to indicate your answer. Use only a blue or black pen to shade the boxes. If you make a mistake, place a cross through that square, do not erase or use correction fluid, and shade your new answer. Marks will not be deducted for incorrect answers. No marks will be given if more than one answer is completed for any question.

Sections Two and Three: Write answers in this Question/Answer Booklet.

- You must be careful to confine your responses to the specific questions asked and to follow any instructions that are specific to a particular question.
- Spare pages are included at the end of this booklet. They can be used for planning your responses and/or as additional space if required to continue an answer.
 - Planning: If you use the spare pages for planning, indicate this clearly at the top of the page.
 - Continuing an answer: If you need to use the space to continue an answer, indicate in the original answer space where the answer is continued, i.e. give the page number. Fill in the number of the question(s) that you are continuing to answer at the top of the page.

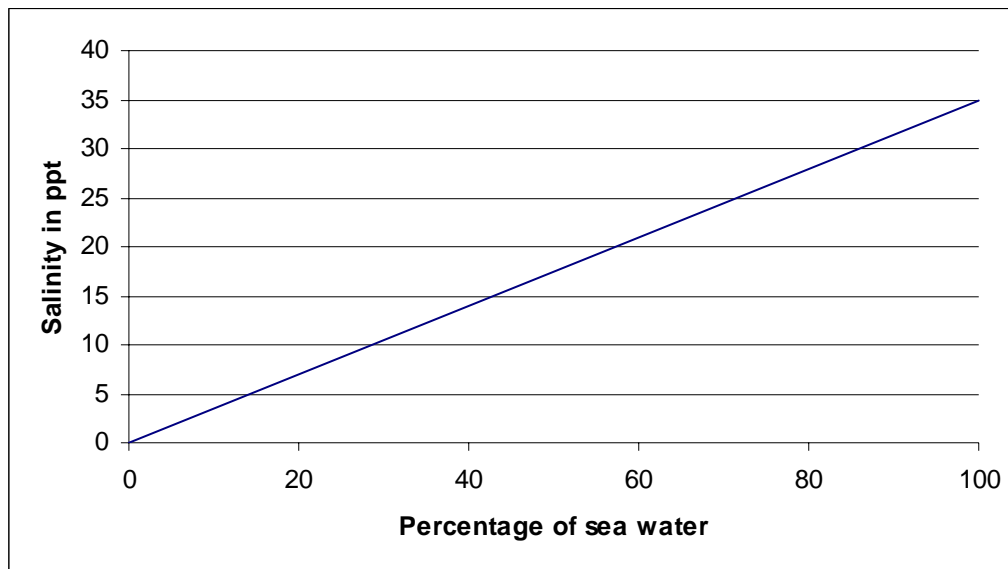
Section One: Multiple-choice

20% (20 Marks)

This section has **20** questions. Answer **all** questions on the separate Multiple-choice Answer Sheet provided. For each question shade the box to indicate your answer. Use only a blue or black pen to shade the boxes. If you make a mistake, place a cross through that square, do not erase or use correction fluid, and shade your new answer. Marks will not be deducted for incorrect answers. No marks will be given if more than one answer is completed for any question.

Suggested working time: 30 minutes.

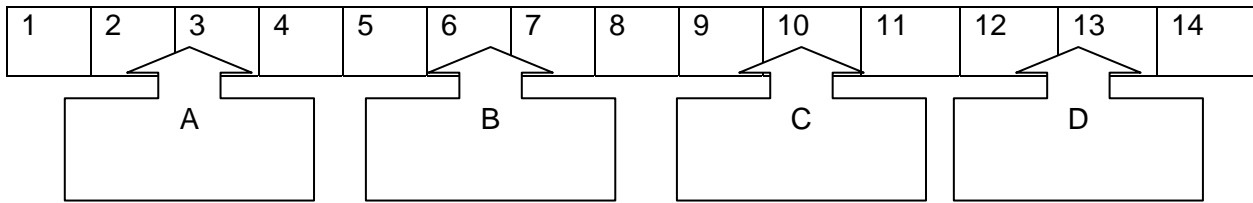
1. This graph shows how the salinity of a mixture of sea water and fresh water changes as sea water is mixed with fresh water.



If the salinity of a sample is 20 parts per thousand (ppt), the percentages of sea water and fresh water are closest to

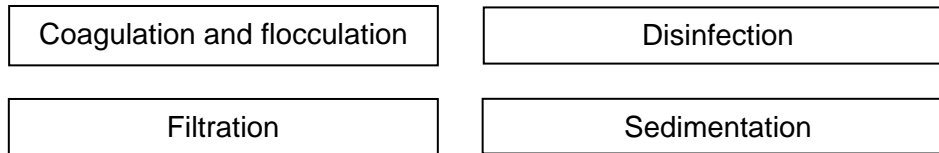
- (a) 7% sea water, 93% fresh water.
- (b) 20% sea water, 80% fresh water.
- (c) 30% sea water, 70% fresh water.
- (d) 60% sea water, 40% fresh water.

2. Four substances A, B C and D are placed on the pH scale as shown. Which one has the highest hydrogen ion concentration?



- (a) A
 (b) B
 (c) C
 (d) D
3. Which one of the following best defines specific heat capacity?
- (a) The amount of heat energy required to raise the temperature of 1 kg of a substance by 1°C.
- (b) The specific temperature of 1 kg of a substance after being left at 1°C for one minute.
- (c) The ability of a substance to resist melting when left at a temperature above its melting point.
- (d) the difference between melting point and boiling point.
4. Most of the potable water supplied by the Water Corporation through the Integrated Water Supply Scheme is used by
- (a) householders.
 (b) business.
 (c) agriculture.
 (d) public parks and gardens.
5. Which one of the following does **not** account for the observation that many introduced species will increase their population size rapidly when introduced into a new area?
- (a) There is an abundance of territory.
 (b) Their tolerance limits are narrow.
 (c) There is a lack of natural predators.
 (d) There is a plentiful food supply.

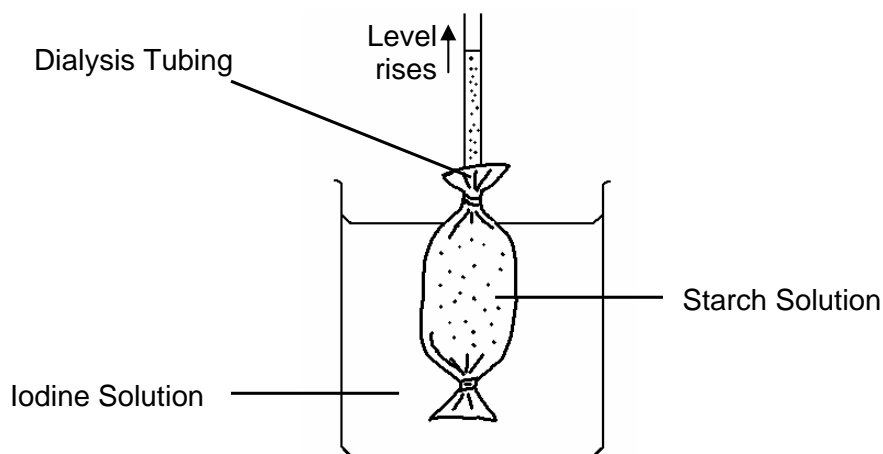
6. The following processes are used to treat water to make it suitable for drinking.



The order that best represents how drinking water is treated is

- (a) coagulation and flocculation → sedimentation → filtration → disinfection.
 (b) filtration → disinfection → coagulation and flocculation → sedimentation.
 (c) sedimentation → filtration → disinfection → coagulation and flocculation.
 (d) disinfection → filtration → coagulation and flocculation → sedimentation.
7. Which one of the following distances is greatest for a vehicle travelling at the speed limit of 100 km h^{-1} on the Kwinana Freeway?
- (a) stopping distance
 (b) braking distance
 (c) reaction distance
 (d) vehicle length
8. Most people can tell apart a note played on a piano from the same note played on a flute. The characteristic of sound that allows people to do this is
- (a) loudness
 (b) quality
 (c) frequency
 (d) amplitude

- 9.



In the system illustrated above, a bag made from dialysis tubing (a semi-permeable membrane) is filled with a starch solution and immersed in an iodine solution in a beaker.

Shortly after being immersed, the level of the liquid in the tube will rise because

- (a) more iodine molecules will enter the bag than starch molecules will leave.
 (b) more starch molecules will leave the bag than iodine molecules will enter.
 (c) more water molecules will enter than will leave the bag.
 (d) more water molecules will leave than will enter the bag.

See next page

10. Which one of the following statements best describes the movement of matter and energy in an ecosystem?
- (a) Producers convert matter to energy, which then passes through the levels before being recycled.
 - (b) Consumers absorb heat energy from the environment and convert it to matter, which is then recycled.
 - (c) Producers convert light energy to heat energy, which is then used to support the consumers.
 - (d) Energy enters an ecosystem as light and is lost as heat, while matter is recycled.
11. Put the following in order to show the sequence of sound vibrations passing through the ear.

A. Inside the ear there are tiny cells covered with 'hairs' that vibrate. When this happens, a message is sent to the brain.	B. The eardrum vibrates.
C. The small bones (hammer, anvil and stirrup) vibrate.	D. This vibration is passed through to the cochlea.

The best order to describe the journey of a sound vibration through the ear is

- (a) B → A → C → D
 - (b) C → B → D → A
 - (c) A → B → D → C
 - (d) B → C → D → A
12. In recent years, the higher levels of carbon dioxide in the atmosphere have led to an increase in the amount of carbon dioxide being dissolved in the sea. As a result, the pH of the sea has changed from approximately pH 8.4 to pH 8.2. This change has serious consequences for sea life.
- Looking at the pH figures, you can deduce that
- (a) the sea has become acidic.
 - (b) the sea has become more alkaline.
 - (c) the sea has become less alkaline.
 - (d) the sea is neutral.
13. Tony plays a note on the piano. He then plays a higher, louder note. The second note has a
- (a) higher frequency, larger amplitude.
 - (b) lower frequency, larger amplitude.
 - (c) higher frequency, smaller amplitude.
 - (d) lower frequency, smaller amplitude.

14. The speed of sound in air is 330 m s^{-1} . If a sound has a frequency of 100 Hz , what is its wavelength?
- (a) 0.33 m
 - (b) 3.3 m
 - (c) 33 m
 - (d) 330 m
15. Texting while driving is illegal. Pauline was texting when driving at 100 km h^{-1} (28 m s^{-1}). She was distracted for 3 s while she sent the text message. Approximately how far did she travel during this reaction time?
- (a) 10 m
 - (b) 30 m
 - (c) 85 m
 - (d) 300 m
16. Choose the statement that does **not** correctly match the drug with its characteristics.
- (a) Alcohol is a depressant.
 - (b) Cannabis can be a hallucinogen.
 - (c) Speed is a stimulant.
 - (d) Ice (methyl amphetamine) is a depressant.
17. Which statement about solubility in water is true?
- (a) Most solids and gases become more soluble as water temperature increases.
 - (b) Most solids and gases become less soluble as water temperature increases.
 - (c) Most solids become more soluble and gases become less soluble as water temperature increases.
 - (d) Most solids become less soluble and gases become more soluble as water temperature increases.
18. The stopping distance of a vehicle on a dry road is less than on a wet road. This is because
- (a) the driver's reaction time increases.
 - (b) the vehicle's momentum is greater.
 - (c) the driver is less alert.
 - (d) the friction between its tyres and the road is less.

19. The government legislates for a range of speeds in different environments.

Near schools	40 km h ⁻¹
Freeways	100 km h ⁻¹
Local roads	50 km h ⁻¹
Country roads	110 km h ⁻¹

Governments do this to

- (a) increase revenue.
 - (b) slow traffic down.
 - (c) reduce the number of accidents.
 - (d) maintain even traffic flow.
20. Sound waves are compressions and rarefactions travelling through a medium such as air. The velocity of the sound depends on
- (a) how large the compressions are.
 - (b) the distance between the rarefactions.
 - (c) the number of compressions in one second.
 - (d) the medium that the sound is travelling through.

End of Section One

Section Two: Short response**60% (120 Marks)**

This section has **eight (8)** questions. Answer **all** questions. Write your answers in the space provided.

Spare pages are included at the end of this booklet. They can be used for planning your responses and/or as additional space if required to continue an answer.

- **Planning:** If you use the spare pages for planning, indicate this clearly at the top of the page.
- **Continuing an answer:** If you need to use the space to continue an answer, indicate in the original answer space where the answer is continued, i.e. give the page number. Fill in the number of the question(s) that you are continuing to answer at the top of the page.

Suggested working time: 110 minutes.

Question 21**(17 marks)**

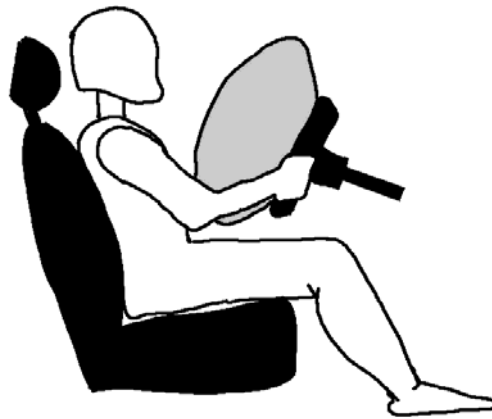
While driving home, Paul was stopped by the police. The police decided to test whether he was affected by drugs.

- (a) Name and describe a roadside test the police could use for this purpose. (2 marks)

- (b) If this test is positive, what is the next step in the testing procedure? (1 mark)

- (c) Explain why driving while under the influence of methylamphetamines is illegal. (2 marks)

An airbag is a safety device that inflates automatically if a vehicle is involved in an impact. Front seat airbags are fitted in the steering wheel or dashboard.



Between 1990 and 2008, 3.3 million airbags were deployed during road traffic accidents in the United States. It is thought that these airbags directly saved 6377 lives and prevented many more injuries. However the same airbags directly caused 175 deaths, including 104 children.

- (d) Explain, in terms of forces and time, why airbags are effective in reducing injury in a crash. (2 marks)

- (e) What feature of an airbag's design makes it dangerous for small children sitting in the front passenger seat of a vehicle? (1 mark)

- (f) Name **two (2)** injuries that might result from this design feature. (2 marks)

One: _____

Two: _____

- (g) Of the 175 deaths caused by airbags, what percentage involved children? (2 marks)

- (h) Justify the Australian law that makes it illegal for children under 12 to sit in the front passenger seat of a vehicle fitted with dashboard airbags. (1 mark)

- (i) Describe **two (2)** design features, other than airbags, that increase the safety of the occupants of motor vehicles. (4 marks)

One: _____

Two: _____

Question 22

(22 marks)

Daniel, an 18-year-old student, was travelling from Perth to Dunsborough for Leavers Week with three friends and all their gear for a week's camping in tents. Being extremely organised, he wanted to work out roughly how far they would travel so he could estimate how much it would cost for petrol. He knew that travelling at an average speed of 80 km h^{-1} it would take them 3 hours and 30 minutes without any stops. Daniel's father encouraged him to schedule a break during the trip.

(a) Calculate how far Daniel would travel. (2 marks)

(b) State a reason, relating to safety, why Daniel was encouraged to schedule a break during the trip. (1 mark)

(c) Daniel stopped for 10.0 minutes at a roadhouse. Calculate the new average speed required to complete the journey in 3 hours and 20 minutes and arrive at the time originally planned. (2 marks)

(d) During the drive, Daniel drove at the usual distance behind the truck in front. However, when the truck in front suddenly braked, Daniel found that it took longer for his car to come to a stop than usual. What caused this happen? Explain why, using physics principles. (3 marks)

- (e) When Daniel noticed the emergency and reacted by braking, a series of processes occurred in his nervous system that enabled his body to react. Describe these processes. (5 marks)

- (f) Despite the fact that young males have faster reaction times than older male drivers, almost half of all male deaths between the ages of 20 and 25 years are due to fatal car crashes. Give **three (3)** reasons why this is so. (3 marks)

One: _____

Two: _____

Three: _____

- (g) Older drivers often appear to react faster than younger drivers in the same situation. Explain why this is so. (2 marks)

- (h) Blood alcohol concentration (BAC) measures the mass (in grams) of alcohol in a 100 mL sample of blood. Daniel had been drinking at 'Leavers' and decided to drive back from the party to where he was staying. On the way, he was stopped by police. If Daniel had 0.04 g of alcohol in a 100 mL sample of blood, what would be his BAC? (2 marks)

- (i) Did Daniel commit a drink-related offence? Explain your answer. (2 marks)

Question 23

(19 marks)

For an Integrated Science assignment, Jesse, Jamie and Jay conducted an investigation on hearing. They tested the hearing range of 12 people of different age groups, and the table below shows the minimum loudness at which each person could hear the nominated frequency.

Age group	Name	Frequency 2000 Hz	Frequency 4000 Hz	Frequency 6000 Hz	Frequency 8000 Hz
		Decibel	Decibel	Decibel	Decibel
15 - 18	Jo	15	11	16	19
15 - 18	Giorja	18	13	18	23
15 - 18	Jake	16	12	17	21
15 - 18	Riley	18	13	25	90
35 - 38	Lisa	17	14	25	40
35 - 38	Alisha	16	12	23	36
35 - 38	Matt	18	15	27	41
35 - 38	Alex	16	13	23	38
55 - 58	Belle	18	16	38	90
55 - 58	Sonia	19	15	41	no hearing
55 - 58	Jason	17	16	35	86
55 - 58	Jarred	19	14	42	no hearing

- (a) Write an hypothesis for this investigation. (1 mark)

- (b) Name the dependent variable. (1 mark)

- (c) Name the independent variables. (2 marks)

- (d) Explain how Riley's results differed from those of the other people in her age group. (1 mark)

- (e) Write a conclusion for the investigation based on the data and explain **two (2)** possible causes for the trend that was shown. (3 marks)

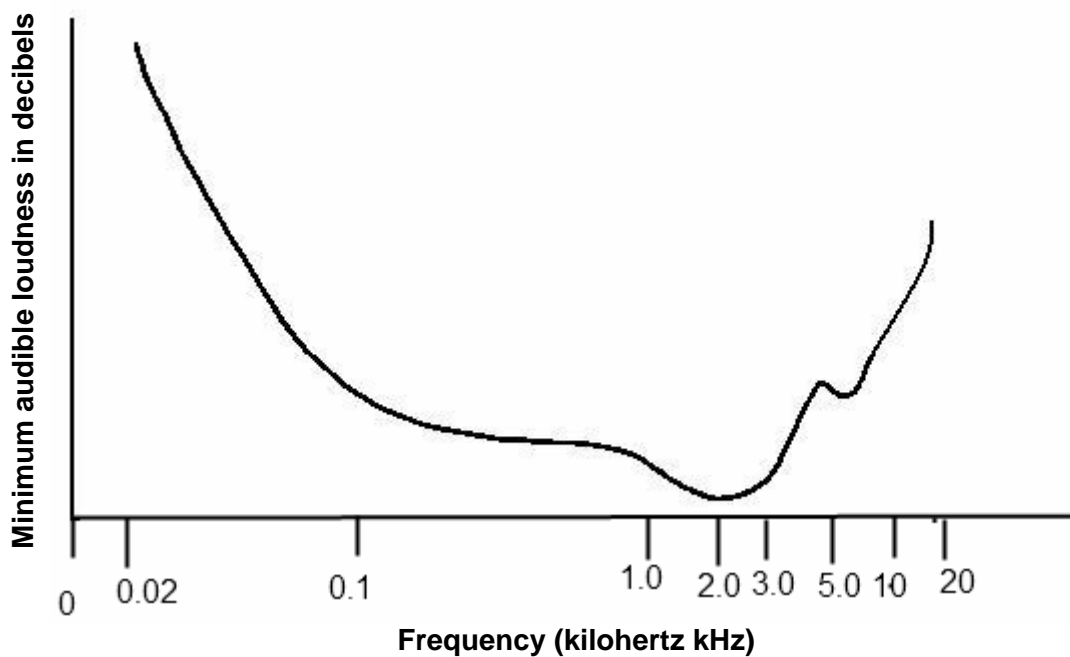
Conclusion

Possible causes

One: _____

Two: _____

Riley's friend Stacey enjoys listening to live music. Stacey has a hearing test before going to a rock concert. The graph shows the minimum decibel level Stacey can hear over a range of frequencies before the concert.



- (f) At what frequency is Stacey's hearing at its most sensitive? (1 mark)

- (g) Stacey's frequency range is: (2 marks)

_____ to _____

- (h) **Show on the graph** how Riley's results from the table on the previous page might differ from those of Stacey. (1 mark)

(i) Name Riley's type of hearing loss. (1 mark)

(j) Explain how this type of hearing loss is caused and a possible method of correcting it. (2 marks)

Cause of Riley's hearing loss:

Method of correcting:

(k) Hearing aids help people who are unable to hear soft sounds clearly. What does a hearing aid do to overcome these problems? On what part of the ear does the hearing aid directly act? (3 marks)

Hearing soft sounds _____

Hearing clearly _____

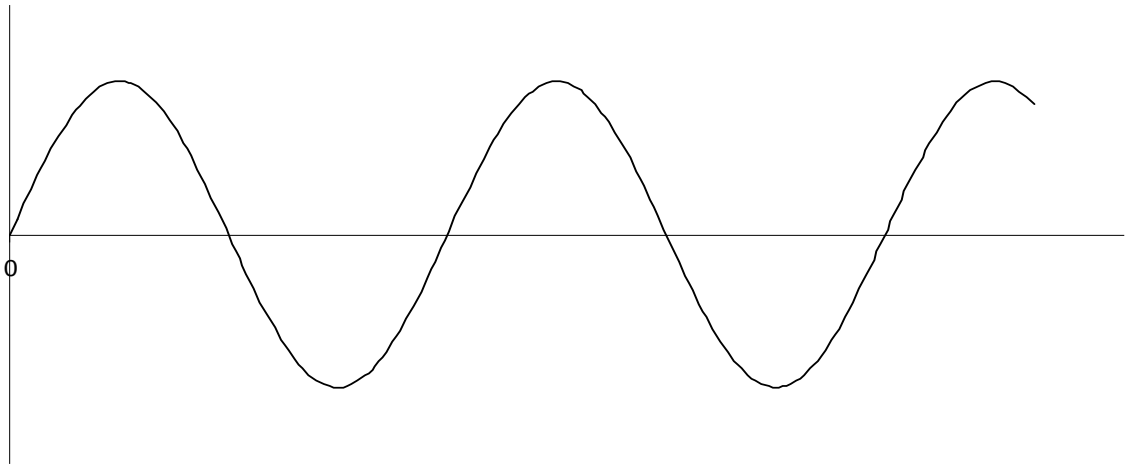
Action of hearing aid _____

(l) What can Stacey do to avoid hearing loss if she is also repeatedly exposed to loud noise at work? (1 mark)

Question 24

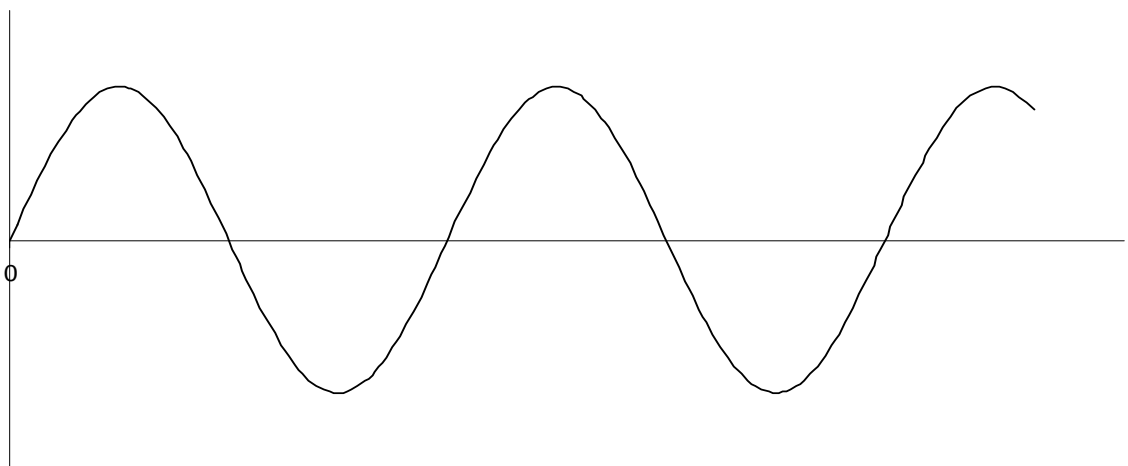
(9 marks)

The diagram represents a sound wave.



- (a) Label the vertical and horizontal axes so that you can show the amplitude and wavelength of one wave. (2 marks)
- (b) Show and label the amplitude. (1 mark)
- (c) Show and label the wavelength. (1 mark)
- (d) On a similar sound wave diagram, how would you need to change the label on one axis to be able to show the period of the wave? (1 mark)

- (e) On the diagram below, draw a sound wave of twice the frequency and the same amplitude as the one given. (2 marks)



(f) Explain how the ear determines differences in the pitch and loudness of sounds.

(2 marks)

Pitch:

Loudness:

Question 25

(12 marks)

(a) Using labelled diagrams, describe the following behaviours of waves.

(6 marks)

(i) Reflection

(ii) Absorption

(iii) Echoes

- (b) When designing a concert hall, an architect needs to ensure that the acoustics are appropriate. Discuss the effect of reflection, absorption and echoes on the acoustics of a concert hall. (6 marks)

Question 26

(13 marks)

Water supplies are important for sustaining large populations. Most of the water on Earth has a great deal of salt dissolved in it, which generally makes it unsuitable for a variety of human uses.

- (a) Recent changes in rainfall patterns in Western Australia have had a major impact on available water supplies. Describe the changing rainfall patterns in Western Australia. (2 marks)

- (b) State **three (3)** major factors to consider when deciding on the placement of a local water catchment area. (3 marks)

One: _____

Two: _____

Three: _____

Grey water is a potential source of fresh water.

- (c) List **two (2)** examples of grey water. (2 marks)

One: _____

Two: _____

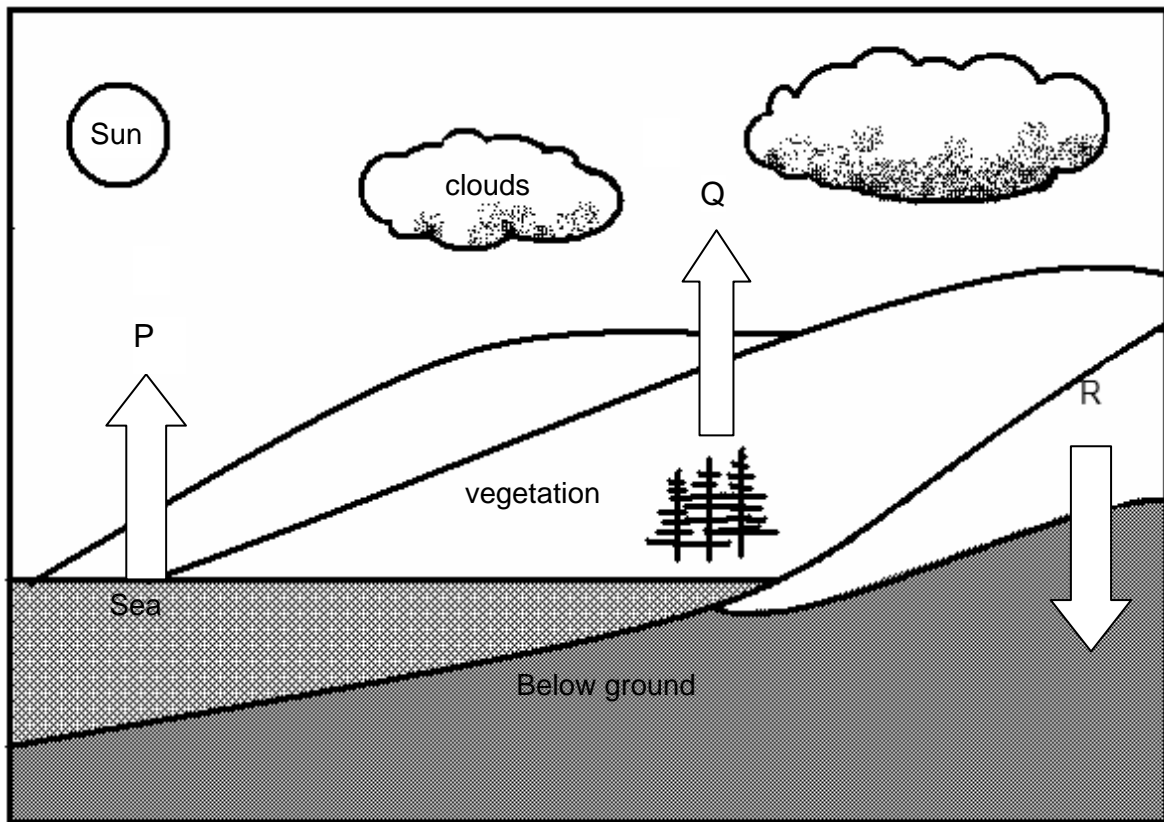
(d) Name the process used to remove salt from salt water to give fresh water. (1 mark)

(e) Name and describe a method by which the above process can be achieved on a large scale. (5 marks)

Question 27

(14 marks)

Below is a diagram of the water cycle.



(a) Using words chosen from the following list (not all words will be required), label the processes P, Q and R. (3 marks)

- evaporation
- distillation
- respiration
- transpiration
- precipitation
- condensation
- run off
- infiltration
- sublimation

P _____

Q _____

R _____

(b) Many single-celled marine algae store their food as oil droplets, which have a lower density than water. Like plants, algae need light to photosynthesise. Explain why having a lower density would be an advantage for these simple algae. (2 marks)

- (c) Ice has a lower density than water. Explain the significance of this for aquatic life in cold regions. (2 marks)

- (d) A corked floating bottle moves downstream from fresh water into salt water. Circle the word(s) to complete the sentence. (2 marks)

- (i) The buoyancy of the bottle will

increase

stay the same

decrease

- (ii) The degree to which the bottle is submerged will

increase

stay the same

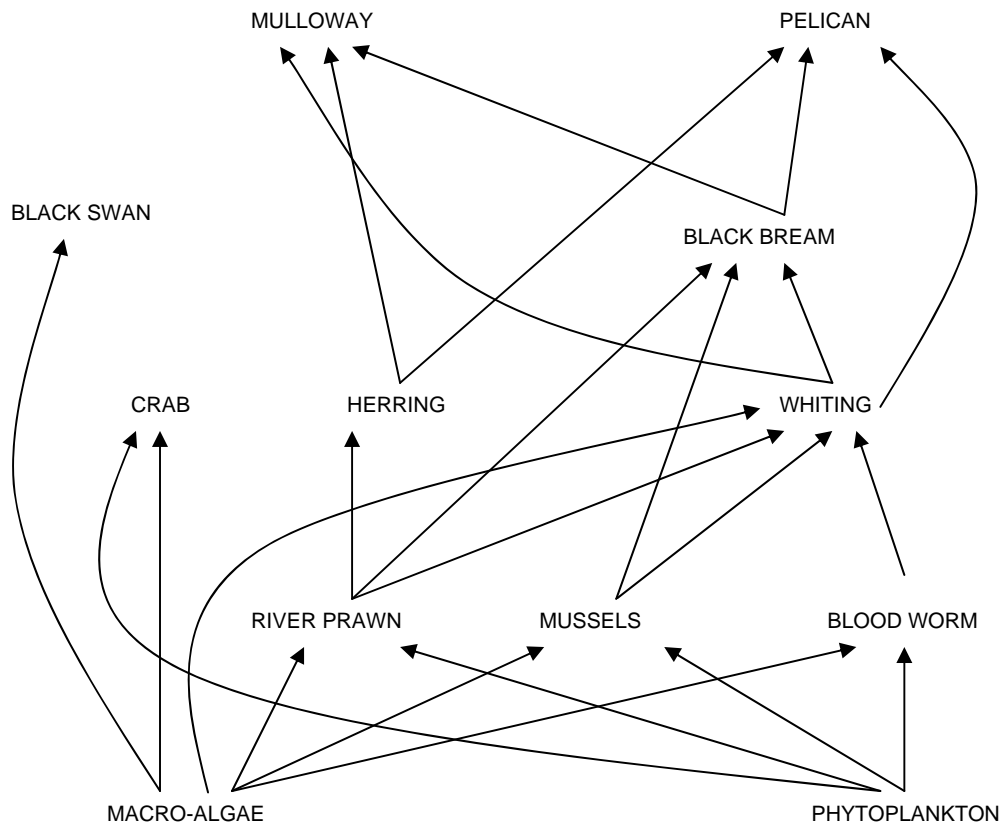
decrease

- (e) Explain why ionic solids are soluble in water. A labelled diagram may be useful. (5 marks)

Question 28

(14 marks)

TYPICAL RIVER FOOD WEB



- (a) Identify **two (2)** producers in this food web. (2 marks)

One: _____

Two: _____

Monitoring revealed that mussels and prawns in a river had high levels of toxic chemicals in their tissues.

- (b) The authorities subsequently banned the taking of fish from the river because of the potential health hazard.

- (i) What is the name of the process that caused this health hazard? (1 mark)

- (ii) Explain what happened in this process. (2 marks)

- (c) Aquatic conditions changed so that the mussels and blood worms in the food web decreased in number and died out. Use the food web to describe changes that would occur over time to the black bream population in the river. (2 marks)

- (d) Black bream are known to live in either fresh or salt water. When they go from fresh water to salt water, they require a period of time to allow them to adjust to the change in salt concentration in the water.

- (i) Explain how black bream maintain internal salt and water balance while they are in fresh water. (4 marks)

- (ii) Explain why black bream cannot move quickly from fresh water to the ocean. (3 marks)

Section Three: Comprehension**20% (20 Marks)**

This section contains **one (1)** question. You must answer all parts of this question. Write your answer in the spaces provided.

Spare pages are included at the end of this booklet. They can be used for planning your answers and/or as additional space if required to continue an answer.

- Planning: If you use the spare pages for planning, indicate this clearly at the top of the page.
- Continuing an answer: If you need to use the space to continue an answer, indicate in the original answer space where the answer is continued, i.e. give the page number. Fill in the number of the question(s) that you are continuing to answer at the top of the page.

Suggested working time: 40 minutes.

Question 29**(20 marks)**

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- (a) Explain why the inflow of large amounts of organic matter leads to low levels of oxygen in the water. (2 marks)

- (b) Describe two (2) ways in which warmer temperatures affect the rivers' ecosystems. (2 marks)

One: _____

Two: _____

- (c) In **summer**, other than high nutrient levels and high water temperature, name **one (1)** condition that increases the likelihood of an algal bloom in a river. (1 mark)

- (d) The recent storm activity washed large amounts of nutrients into the rivers. Name **two (2)** such nutrients. (2 marks)

One: _____

Two: _____

- (e) State **two (2)** different sources that could lead to these two nutrients entering the river. (2 marks)

One: _____

Two: _____

- (f) The Swan River Trust monitors the salinity, turbidity and pH of river water. Explain what is actually being measured in each test. (3 marks)

Salinity: _____

Turbidity: _____

pH: _____

- (g) When salinity, turbidity and pH conditions become abnormal, the result can be a negative effect (other than death) on both plant and animal aquatic life in the area. For each factor, describe a negative effect on both plants and animals. (6 marks)

Factor	Negative effect on plants	Negative effect on animals
Salinity		
Turbidity		
pH		

- (h) Sometimes it is possible to remove fresh water from the surface of the river, even though salt water has reached that part of the river. Explain how this occurs. (2 marks)

ACKNOWLEDGEMENT

Question 29: Text adapted from: Swan River Trust. (2010). *Swan and Canning Rivers low oxygen*. Retrieved March, 2010 from:
www.swanrivertrust.wa.gov.au/Media%20Release/media_20100324.aspx

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